eruption of the hands and fingers. The natural impulse was to attribute the eruption to novocain. A patch test of this substance on one dentist was positive, thus confirming the clinical diagnosis, while the other failed to react. A careful microscopic examination of scales from the hand of the second dentist revealed large numbers of fungi, thus substantiating the accuracy of the negative patch test to novocain. The appearance of the eruption in both cases was strikingly similar, and I feel that a differentiation on clinical grounds alone would have been impossible.

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DOCTOR GRAVES (Closing).—The discussers have emphasized the important points, so that little more need be said. The application of the patch test to dermatitis venenata is apparent. It is to be hoped that refinements of the test will enlarge its scope of usefulness.

The use of this test by means of prolonged contact may demonstrate a reaction in some cases of "chronic eczema." These may then be classified as chronic dermatitis venenata. In this manner the applicability of the term "eczema" can be further restricted.

CALCULOUS ANURIA*

REPORT OF CASE

By EDGAR C. LEE, M. D.
San Diego

DISCUSSION *by Nathan G. Hale, M. D., Sacramento; A. J. Scholl, M. D., Los Angeles; Franklin Farman, M. D., Los Angeles.*

ONE of the most serious complications arising in renal lithiasis is anuria. The conditions in which complete cessation of urinary secretion occurs have long been recognized, but it may be permissible to briefly review them.

First: Both kidneys may simultaneously become obstructed by stone.

Second: The obstruction may affect a single kidney, the opposite kidney being congenitally absent or renal function having been previously destroyed by disease.

Third: A fused ureter draining both kidneys may become blocked.

Fourth: A reflex anuria may occur, the obstruction to one kidney resulting in a reflex inhibition of kidney function on the opposite side.

Some of the salient points in the clinical course of calculous anuria were well shown in a case recently observed by the writer.

REPORT OF CASE

The patient was a man forty-five years of age, who was admitted to the hospital on the 28th of June, 1929. He was a well-developed man who worked as a laborer; his weight was 170 pounds, and he had always been in good health. There was no history of any previous symptoms referable to the urinary tract. The onset of his illness began two days before he was admitted to the hospital and was characterized by diffuse abdominal pain radiating toward the right flank. This was accompanied by nausea and vomiting; the pain subsided after a few hours, but the vomiting was persistent.

Examination at the hospital showed abdominal distention with marked rigidity of the abdominal muscles, no area of pronounced tenderness was made out either in the abdomen or in the region of either kidney, and there were no other physical findings.

The pulse rate was 72; temperature, 97.6; blood examination showed 4,120,000 red cells and 9900 leukocytes with a differential count of 85 per cent polymorphonuclear cells. The hemoglobin index was 70 per cent; the blood pressure was found to be 160 over 110.

On this day he voided eight ounces of urine. The specimen was brownish in color and showed a faint trace of albumen and no sugar. The centrifuged specimen showed many red blood corpuscles and a moderate number of epithelial cells and leukocytes.

Roentgenologic examination of the urinary tract revealed a shadow of stone density about five to seven millimeters in size in the region of the right kidney. On the left side, at the level of the first lumbar transverse process, a faintly outlined shadow was shown, the character of which was not determined; it was not of stone density and suggested a partially calcified mesenteric gland.

An enema afforded the patient considerable relief from his abdominal distention and his general condition appeared good, nausea and vomiting being at this time the outstanding symptoms.

The blood chemistry which was done on the following day showed 59 milligrams of urea nitrogen per 100 cubic centimeters of blood with a 2.5 milligram of creatinin.

A cystoscopy on this day showed 40 cubic centimeters of dark-colored urine in the bladder. The bladder mucosa was normal throughout, the right ureteral opening appeared somewhat swollen, and the left ureteral opening was not visualized. A No. 6 catheter passed to the level of the right kidney pelvis without meeting any obstruction, but it was not possible to establish any urinary drainage through the catheter. Ten cubic centimeters of indigo carmin were injected intravenously, but there was no return of the dye from the catheter in the right ureter nor was any dye observed being brought into the bladder from the left side. On the afternoon of this day the patient voided twelve ounces of urine, the character of which was similar to the specimens examined previously.

Fluids were given freely, the patient being able to retain water by mouth; and the rectal drip was well tolerated. The abdominal muscles were now comparatively relaxed, and nausea, though recurring at intervals, was not enough to prevent the patient from taking water by mouth.

During his third day in the hospital he voided three ounces of dark-colored urine. His general condition remained good and he was apparently relieved of his previous abdominal distress.

There was no further renal secretion during the next three days in spite of which no symptoms suggestive of uremia developed. Glucose solution was given intravenously; the patient's skin was moist and there was no apparent change in his general condition. On this day the blood chemistry showed a rise of urea-nitrogen to 140 milligrams per 100 cubic centimeters of blood; the creatinin curve reached 6.8; the patient, who had been advised previously regarding surgical treatment, then consented to an operation.

Under ethylene-oxygen anesthesia the right kidney was exposed and found to be greatly engorged with the capsule very tense. A nephrotomy was done by an incision over the convex border of the kidney and the pelvis was explored for the presence of a calculus. As no stone could be palpated, no prolonged search was made and a soft drainage tube was placed in the pelvis through the kidney incision and the wound was closed in the ordinary manner. Before the operation was completed there was free drainage of blood-stained fluid through the tube.

The patient was returned to his room from the surgery at 2:30 p. m. and 1000 cubic centimeters of normal saline solution was given intravenously. By

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* Read before the Urology Section of the California Medical Association at the sixtieth annual session, San Francisco, April 27-30, 1931.

6 p. m. the drainage through the tube measured 690 cubic centimeters, and during the next twelve hours 4590 cubic centimeters of blood-stained urine was collected from the tube, in addition to which there was considerable drainage into the dressings. During the following twenty-four hours the amount of urine collected measured 3060 cubic centimeters and on this day, the second following the nephrotomy, blood chemistry showed a reduction of the urea-nitrogen to 18 milligrams per 100 cubic centimeters of blood, and creatinin had dropped to 1.3 milligrams per 100 cubic centimeters. The next period of twenty-four hours showed a secretion of 2800 cubic centimeters of urine after which the total amount for twenty-four-hour periods varied from 2030 to 2090 cubic centimeters.

The patient's subsequent progress was uneventful. The tube draining the kidney was removed on the fifth day. The wound healed well but for a small urinary sinus which discharged small amounts of urine intermittently, but closed at the end of about twenty days.

Sixteen days following the day of operation five cubic centimeters of indigo carmin were given intravenously and a cystoscopy showed that the dye was being secreted from the right ureteral opening in normal time and good volume.

A roentgenogram showed the small opacity previously reported in the right kidney area to be now located at the level of the middle portion of the sacrum on the right side.

The patient's convalescence was rapid; he returned to his work and was not under observation until seen a year later. At this time a roentgenogram showed no shadow suggestive of a calculus. The urine analysis was negative. One cubic centimeter of phthalein intramuscularly showed a return of 85 per cent of the dye in two hours and fifteen minutes. Forty grams of uroselectan were given intravenously and a roentgenogram showed a clear outline of kidney pelvis and major calices on the right side, whereas no opacity was observed on the left side.

COMMENT

A sudden suppression of urine due to obstruction caused by calculus may be partial or complete. It was formerly thought that a sudden blocking of the ureteral tract would lead to an immediate suppression, but it is now considered that the condition resulting is one of retention in the ureter and renal pelvis. This retention may be of varying degree and the intrarenal pressure resulting is the causative factor in bringing about total suppression of secretion.

Calculous anuria is generally considered to be the result of mechanical obstruction. The question of reflex inhibition has been a much debated one. Many case reports would tend to prove the occurrence of reflex anuria, but autopsy findings do not support these views, and only these case reports can be accepted as proof of an inhibited secretion in which the reflexly inhibited kidney was shown to be healthy. It is assumed that reflex anuria results from contracture of the intrarenal vessels which have received their impulse from the vasomotor nerves. Anuria following burns, abdominal trauma, and operations on the kidney and bladder, is explained by stimulation of the splanchnic nerves.

Frank concluded that reflex inhibition of function occurring in a healthy kidney can be explained on the basis of sudden circulatory changes, the compensatory vascular activity causing an overdistention from the arterial side with resultant venous congestion.

The majority of cases of calculous anuria occur in the middle-aged and the condition is more frequently seen in the male, but instances of children and infants suffering from this disease have been reported.

The onset is usually accompanied by pain in the region of the kidney which has become suddenly blocked, the severity and duration of the pain are quite variable, there may be all the characteristics of a severe renal crisis or the patient may complain of a dull ache in the lumbar region. Radiation of this pain along the ureter and toward the genitals is not a constant feature. Again there may not be any pain referable to either kidney region. There is usually a cessation of pain in a day or two and it would seem that this is dependent on an equalization of the pressure within the renal vessels. There may be some bladder irritation at this time with a frequent desire to void, though no urine or very little is passed.

The general condition of the patient is often quite unimpaired and this period of tolerance has been reported as lasting as long as twenty days. The average length of time of this period in a series of sixty-two collected case reports was from five to six days. During this stage the patient may be entirely free from pain and mentally clear, dryness of skin, gaseous distention of the bowels, nausea and vomiting, being the only symptoms complained of. It has been observed that this period is prolonged in cases of hydronephrosis. The onset of the uremic period may occur without warning, or such symptoms as drowsiness, headaches, and muscular twitchings may foretell the impending change.

DIAGNOSIS

Regarding the diagnosis it must be remembered that there may not be anything in the previous history to suggest the renal secretion was previously limited to one kidney.

Pain and anuria, either complete or partial, are the characteristic symptoms of the disease, and the severity and location of the pain will suggest on which side the sudden blocking has occurred. The roentgenographic findings of a shadow of stone density and the localization of the shadow by means of an opaque catheter are the first steps toward the diagnosis; with this in view it is well to routinely make two exposures for the purpose of a stereoscopic view.

In a review of seven cases, Cahill and Gile state that in only three patients were the roentgenographic findings sufficiently characteristic of calculus to form the basis of a diagnosis.

Cystoscopy may show the impacted calculus at the ureterovesical orifice or the absolute block to the further advance of the ureteral catheter may localize the position of the stone.

Intravenous injection of a dye following the forcing of fluids will show the failure of renal secretion from both ureteral orifices. The use of opaque solutions for further outline or localization of the stone should not be necessary and may prove harmful. It is to be remembered that

an impacted calculus may completely block the drainage of fluid from above and yet permit the passage of fluid injected from below the point of obstruction.

The changes in the blood chemistry are dependent on the duration of the anuria. Urea-nitrogen and creatinin retention is of the rapidly cumulative type and since the basic kidney substance has not been destroyed a prompt change toward the normal will usually follow the relief from obstruction.

TREATMENT

The treatment toward the relief of the anuria will necessarily be medical at the onset. Hot packs and the administration of fluids subpectorally or intravenously have been the usual procedure, and five per cent glucose solution has been employed for the diuretic effect.

The use of the duodenal tube in the treatment of a case of reflex anuria was reported by McCarthy. Following the administration of five per cent glucose and two per cent sodium bicarbonate, through the duodenal tube, there was an immediate and marked increase in renal secretion.

Ureteral catheterization has been effective in a number of cases in establishing drainage and causing a return of renal function, and the use of the indwelling ureteral catheter over a period of twenty-four to forty-eight hours has been suggested.

The expectant treatment should not be carried on longer than two or three days and the apparent condition of well-being on the part of the patient should not misguide us regarding the necessity of surgical relief.

Increased mortality accompanying longer duration of this period is an established fact.

A nephrotomy will be the means of establishing drainage when the expectant treatment has failed, and with this accomplished, if a small stone is not readily found, further and prolonged exploration of the kidney in search of the stone should be avoided.

Retrograde catheterization of the ureter may displace a ureteral calculus, but the fact that one may be dealing with a solitary kidney should be borne in mind.

Medico-Dental Building.

DISCUSSION

NATHAN G. HALE, M. D. (Medico-Dental Building, Sacramento).—Relief of back pressure and removal of the cause is the modus operandi for all types of cases of calculous anuria. Fortunately in this case there was prompt relief of back pressure. The calculus no doubt passed at a later date and caused no obstruction during its passage.

Calculous anuria in a solitary kidney as this case report presents requires no different management than that of a calculous anuria when there has been a previous nephrectomy. Promptness in operative interference is more liable to be overlooked by the general surgeon, who does not bring to his aid the urologist, whose first thought in any obstruction of the upper urinary tract is usually, "What is the other kidney doing." In this case there was apparently no other kidney, and prolonged delay would no doubt have resulted in greater impairment of kidney function.

A. J. SCHOLL, M. D. (Pacific Mutual Building, Los Angeles).—This paper is timely in that it again presents an old subject for a very necessary review, and reminds us that such conditions still occur and must be recognized. Calculous anuria is the term used to denote suppression of urine which results from the presence of a stone in the kidney or ureter. Before our present day of accurate methods of urologic diagnosis this condition was not infrequently encountered. It is now only rarely observed, as most patients receive treatment before such a stage is reached. On the other hand, anuria occasionally affects persons in robust health and may be sudden and complete in its onset. It still is responsible for the majority of deaths occurring in large series of stone cases such as have recently been reported.

The most important clinical feature of a case of calculous anuria is the fact that it denotes that the patient possesses only one functionally active kidney, the other being absent or destroyed by previous disease. The only exceptions to this rule are those cases in which the shock arising from the sudden blocking of the ureter gives rise to a so-called "reflex suppression" in the opposite kidney which, although functionally active, has suffered from previous disease and so has become more susceptible to any nervous influence.

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FRANKLIN FARMAN, M. D. (1401 South Hope Street, Los Angeles).—Doctor Lee's remarkable case of calculous anuria with recovery following nephrotomy prompts me to briefly cite the circumstances surrounding a similar case.

In August 1925 I was called one night to see a woman, age sixty-two, who was suffering intense right renal area pain and colic. She had passed diminishing quantities of highly colored urine for several days with total anuria for twenty-four hours. The abdomen was greatly distended, tympanitic, and a large, sensitive mass could be made out in the right upper quadrant. She was restless, tongue dry, breath foul, and slightly uriniferous.

The attending physician, a relative, informed me that the patient had gone through similar, less serious attacks, and that it had been previously determined by cystoscopy, x-ray, and functional tests that the left kidney was probably atrophic and nonfunctioning. With this history and the present grave condition of the patient, we determined upon an emergency nephrotomy. The patient was removed by ambulance to the California Hospital and at midnight I performed, under spinal anesthesia, a nephropyelotomy of the right kidney, draining a large hydronephrotic sac of the pelvis and lower pole. As in Doctor Lee's case, no prolonged search for calculi was attempted and, likewise, none found, but it was later determine by x-ray that there were many calcareous-like deposits apparently present in the right kidney.

The patient reacted poorly, with continued manifestations of uremia for two days, but finally passed the "crises" following blood transfusion. No bladder urine appeared for twelve days, all drainage coming through the right nephrotomy wound, proving beyond doubt that the left kidney was functionless. The patient recovered, leaving the hospital within one month.

The points that impress me about calculous anuria and anuria in general is the remarkable tolerance of the body to uremic poisoning, patients being known to recover after twenty days of total suppression of kidney excretion. Of course, partial compensatory elimination takes place during this period through the bowel, skin, and lungs.

Likewise, the need for conservative "nonpanicky" management in instances of anuria is obvious and one should be guided in operative indications as much by a general estimate of the patient's condition and type of kidney lesion involved as by laboratory tests indicating rising blood nitrogen retention. But when the indication is apparent prompt nephrotomy is a life-saving measure.